05-31-00

A

Practitioner's Docket No. 950-009252-US (PAR) **PATENT**

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. § 601, 7th ed.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of

Inventor(s): McCullough et al.

WARNING: *37 C.F.R. § 1.41(a)(1) points out:*

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): SAMPLE HOLDING CHUCK FOR USE IN REACTOR AND REACTOR USING SAME

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date 5/30/00, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL336864148US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Elaine Mian
(type or print name of person mailing paper)

Elaine F. Mian
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

1. Type of Application

This new application is for a(n)

(check one applicable item below)

[X] Original (nonprovisional)

[ ] Design

[ ] Plant

WARNING: ***Do not*** *use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

WARNING: ***Do not*** *use this transmittal for the filing of a provisional application.*

NOTE: If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

[ ] Divisional.

[ ] Continuation.

[ ] Continuation-in-part (C-I-P).

2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

NOTE: A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(l) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

NOTE: If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

WARNING: *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

WARNING: *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).*

☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

3. Papers Enclosed

A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

11 Pages of specification

5 Pages of claims

5 Sheets of drawing

WARNING: ***DO NOT*** *submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).*

NOTE: "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).

☐ formal

☐ informal

B. Other Papers Enclosed

8 Pages of declaration and power of attorney

1 Pages of abstract

_____ Other

4. Additional papers enclosed

☐ Amendment to claims

☐ Cancel in this applications claims _____ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☐ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. § 1.98)

☐ Form PTO–1449 (PTO/SB/08A and 08B)

☐ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

5. Declaration or oath (including power of attorney)

NOTE: A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

NOTE: "The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.62, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors." 37 C.F.R. § 1.41(a)(1).

☒ Enclosed

Executed by

(check **all** *applicable boxes)*

☒ inventor(s).

☐ legal representative of inventor(s). 37 C.F.R. §§ 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

NOTE: Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of *all* the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

☐ Showing that the filing is authorized.
(not required unless called into question. 37 C.F.R. § 1.41(d))

6. Inventorship Statement

WARNING: *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

7. Language

NOTE: An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of $130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

8. Assignment

☒ An assignment of the invention to International Business Machines Corporation

☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☐ will follow.

NOTE: "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

WARNING: *A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.*

9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

NOTE: The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

NOTE: This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. § 1.16)

A. ☒ Regular application

CLAIMS AS FILED				
Number filed	Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) $690.00
Total Claims (37 C.F.R. § 1.16(c))	25 − 20 = 5	×	$ 18.00	90.00
Independent Claims (37 C.F.R. § 1.16(b))	2 − 3 =	×	$ 78.00	
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))		+	$260.00	

☐ Amendment cancelling extra claims is enclosed.

☐ Amendment deleting multiple-dependencies is enclosed.

☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation $ 780.00

B. ☐ Design application ($310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation $_____

C. ☐ Plant application
($480.00—37 C.F.R. § 1.16(g))

Filing fee calculation $_____

11. Small Entity Statement(s)

☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

WARNING: *"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).*

WARNING: *"Small entity status must not be established when the person or persons signing the . . . statement can **unequivocally** make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).*

(complete the following, if applicable)

☐ Status as a small entity was claimed in prior application

_____ / _____, filed on _____, from which benefit is being claimed for this application under:

35 U.S.C. § ☐ 119(e),
☐ 120,
☐ 121,
☐ 365(c),

and which status as a small entity is still proper and desired.

☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of **A**, **B** or **C** above)

$_____

NOTE: Any excess of the full fee paid will be refunded if small entitiy status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

13. Fee Payment Being Made at This Time

☐ Not Enclosed

☐ No filing fee is to be paid at this time.
(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)

☒ Enclosed

☒ Filing fee	$ 780.00
☒ Recording assignment ($40.00; 37 C.F.R. § 1.21(h)) (See attached "COVER SHEET FOR ASSIGNMENT ACCOMPANYING NEW APPLICATION".)	$ 40.00
☐ Petition fee for filing by other than all the inventors or person on behalf of the inventor where inventor refused to sign or cannot be reached ($130.00; 37 C.F.R. §§ 1.47 and 1.17(i))	$
☐ For processing an application with a specification in a non-English language ($130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k))	$
☐ Processing and retention fee ($130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l))	$
☐ Fee for international-type search report ($40.00; 37 C.F.R. § 1.21(e))	$

NOTE: 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed $ 820.00

14. Method of Payment of Fees

☒ Check in the amount of $ 820.00

☐ Charge Account No. _____ in the amount of $_____.

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

15. Authorization to Charge Additional Fees

WARNING: *If no fees are to be paid on filing, the following items should not be completed.*

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 16-1350 :

- ☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)
- ☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☒ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☒ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).
- ☒ 37 C.F.R. § 1.17 (application processing fees)

NOTE: ". . .A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

- ☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . " From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

16. Instructions as to Overpayment

NOTE: ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

- [X] Credit Account No. 16-1350
- [ ] Refund

SIGNATURE OF PRACTITIONER

Reg. No. 29,277

David Aker
(type or print name of attorney)

Tel. No. (203)259-1800

Perman & Green, LLP
P.O. Address

Customer No.

425 Post Road
Fairfield, CT 06430

☐ **Incorporation by reference of added pages**

(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)

☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added _____

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added _____

☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added _____

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added _____

☒ **Statement Where No Further Pages Added**

(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)

☒ This transmittal ends with this page.

950-009252-US(PAR)

Patent Application Papers Of:

Kenneth J. McCullough

Wayne M. Moreau

John P. Simons

Charles J. Taft

For: SAMPLE HOLDING CHUCK FOR USE IN REACTOR AND REACTOR USING SAME

Sample Holding Chuck For Use In Reactor And Reactor Using Same

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a sample holding chuck for a chemical reactor and to a reactor assembly utilizing the chuck. More particularly, it relates to such a chuck which when rotated produces excellent mixing and agitation of the fluid in the reactor.

Background Art

In the production of semiconductor devices, small features are produced by processes involving photolithography, chemical etching, cleaning and drying. One cleaning process that has emerged as being particularly important is the use of a mixture of supercritical carbon dioxide and a co-solvent in a chemical reactor to clean articles such as semiconductor wafers that are being transformed into electronic devices.

One company that makes an apparatus in which, with suitable modifications, such cleaning operations may be performed is PARR Instruments of Moline, Illinois.

The PARR Instrument Reactor Bomb includes a shaft mounted paddle assembly which may be rotated by an external motor to stir the fluid within the vessel. A silicon chip to be cleaned may be mounted on a platform in spaced relation below the paddle. While adequate for many applications, this arrangement has the disadvantage of leaving a dead space of relatively unagitated fluid between the paddle and the wafer. For critical

applications, such as the development and production of microelectronic devices, where the presence of any impurity may prove to be disastrous, this does not produce enough agitation of the fluid to adequately clean the samples. A better approach is required.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an apparatus for thoroughly agitating a fluid in a chemical reaction vessel.

It is another object of the invention to provide an apparatus which efficiently carries away impurities as soon as they are removed from a sample being processed.

In accordance with the invention, a chuck assembly for holding a sample comprises a shaft; a generally circular chuck member, the shaft extending from a first surface of the chuck member; a sample holder associated with a second surface of said chuck member, the second surface being opposite the first a surface; and a sample receiving assembly for holding the sample on the sample holder so that the sample remains fixed to the sample holder when the shaft rotates and causes the chuck member and sample holder to rotate with the shaft. The chuck member has, at its periphery means for propelling a fluid. Further, the chuck member may be generally shaped as a squat cylinder with a plurality of grooves, the grooves extending along an outer surface of the cylinder, the grooves being at an acute angle with respect to a longitudinal axis of the chuck member. Further, in accordance with the invention, the chuck member has a

plurality of openings extending therethrough in a direction parallel to a longitudinal axis of said chuck member.

Also in accordance with the invention, the chuck assembly may be combined with a reactor chamber for receiving the chuck assembly, a spindle assembly for receiving an end of the shaft distal from the chuck member; and a motor for rotating the spindle assembly and the shaft so that the fluid flows generally along the shaft in a first direction and through said openings in the chuck member, around said sample holder, and then along a wall of the chamber in a second direction generally opposite to the first direction. Preferably, the chamber is cylindrical and the fluid flows along a wall of the chamber in the second direction. There is preferably a first opening through which the reaction fluid is introduced into the chamber; and a second opening through which the reaction fluid is removed from said chamber. The first opening is disposed proximate the shaft and the second opening is disposed proximate the wall of the chamber.

A temperature control means is provided for controlling the temperature of the reactor chamber. The temperature control means may comprise a mantel surrounding the reactor chamber; and a controller for controlling the temperature of said mantle.

The sample receiving assembly may comprise at least one clip for holding the sample to the sample holder. The sample holder may have a plurality of through holes formed therein. At least one of the through holes receives a fastener for securing the clip to the sample holder.

The apparatus may further comprise a pressurizing apparatus for pressurizing said reactor chamber to a pressure of up to 10,000 psi.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and other features of the present invention are explained in the following description, taken in connection with the accompanying drawings, wherein:

Fig. 1 is a perspective view of a prior art micro reactor vessel assembly,

Fig. 2A, 2B and 2C are perspective views of different sizes of prior art micro reactor cylinders usable with the prior art reactor vessel assembly of Fig. 1.

Fig. 3 is a perspective view of the prior art micro reactor head of the vessel assembly of Fig. 1.

Fig. 4 is a front elevational view of the apparatus of Fig. 1 in place in a complete and operative assembly.

Fig. 5 is a simplified, schematic, side elevational view of the chuck assembly in accordance with the invention, as used in the assembly of Fig. 4.

Fig. 6A is a bottom view of the chuck member of the chuck assembly of Fig. 5.

Fig. 6B is a side elevational view of the chuck member of the chuck assembly of Fig. 5.

Fig. 6C is a top view of the chuck member of the chuck assembly of Fig. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 illustrates a prior art micro reactor vessel assembly 10 of the type manufactured by PARR Instruments. Broadly, assembly 10 includes a reactor vessel or cylinder 12 (shown in Fig. 2A) and a vessel head 14 shown in Fig. 3. The cylinder may be any of the ones illustrated in Fig. 2A, Fig. 2B or Fig. 2C, the only difference being the chamber volumes, which, by way of example only, may define reaction chambers having volumes of 100 ml, 200 ml and 50 ml for Fig. 2A, Fig. 2B and Fig. 2C respectively.

The cylinder 12 and head 14 are rendered pressure tight by Teflon® rings (not shown) and a clamp assembly shown in Fig. 4.

Referring to Fig. 3 the vessel head 14 includes a first valve assembly 16 having a connection port through which a fluid used in the reaction chamber may be introduced. The fluid flows through a first passageway (not shown) in head 14 and enters the cylinder 12 through a first opening 18. A second valve assembly 20, also having a connection port, is also in communication with a second opening (not shown in Fig. 3) through a second passageway (not shown). Fluid which enters the cylinder, may then also be removed. Further, a fluid stream may be established through cylinder 12, with the fluid entering through valve assembly 16 and exiting through valve assembly 20.

For reasons that will become more apparent with respect to the description associated with Fig. 5, it is preferable that the first opening 18 be located as close as possible to the center of the bottom surface 26 of

head 14. It is preferable that the second opening be located as close to the perimeter of the bottom surface of head 14 as possible.

A pressure gauge 28 is coupled to head 14 to measure the pressure within cylinder 12. A passageway (not shown) connects gauge 28 to opening 18.

Head 14 may include a thermocouple or other suitable temperature measuring device (not shown) connected by an electrical cable 30 to a connector 32. It is thus possible to monitor the temperature of head 14 and then the approximate temperature of the cylinder 12. In practice, the thermocouple may be located in the stream of fluid near opening 18 so that the temperature of fluid entering cylinder 12 is monitored.

Head 14 includes a spindle assembly 34 which may be rotated by an external motor as more fully described below. Spindle assembly 34 includes an internal shaft and appropriate pressure sealing apparatus, such as O rings for making a pressure seal (all not shown). The bottom of the internal shaft is threaded to receive an external shaft 36 which extends through an opening 38 in the bottom surface 26 of head 14 and is centrally located thereon. The distal end of shaft 36 is fitted with a paddle 40 which stirs the fluid in cylinder 12.

As noted above, for critical applications, the stirring action of paddle 40 may not be adequate to properly agitate the fluid. Further, there is no way to assure that impurities on a sample mounted on a pedestal (not shown) in cylinder 12 in spaced facing relationship with paddle 40 will have removed impurities promptly carried

away, without such impurities again being deposited on the sample being cleaned.

Referring to Fig. 4, cylinder 12 and vessel head 14 are placed together with Teflon® rings (not shown) between the respective flanges thereof and clamped together by a pair of clamps 42 which are drawn toward one another by a series of screws (not shown). The screws are progressively torqued and pressure is applied to the Teflon rings to provide a high pressure seal in a manner well known in the art.

Clamps 42 are supported on a plate 44 having an opening (not shown) through which cylinder 12 extends into a temperature mantle 46. Plate 44 and mantle 46 are supported on a motor stand shown generally at 48. Motor stand 48 has a base 50 and an upright member 52 which also supports a motor assembly 54. Motor assembly 54 has a motor shaft 56 extending therefrom which rotates spindle assembly 34.

After the apparatus illustrated in Fig. 4 has been assembled as described above, a fluid inlet line 53 and a fluid outlet line 55 are connected to valve assemblies 16 and 20, respectively. A temperature measuring apparatus is coupled to connector 32. A temperature controller 58 is connected to mantle 46 by a cable 60. Mantle 46 may contain a series of thermoelectric devices, such as Peltier devices, used to control the temperature of cylinder 12, when it extends into an opening in mantle 46. It will be understood that other temperature control devices may be used. It is contemplated that operations may be conducted throughout a temperature range of at least 0° C to 150° C.

A cable 62 connects a motor in motor assembly 54 to a motor controller 64 which may be used to control the speed of rotation of motor shaft 56. Typical rates of rotation are up to 500 rpm, but, in accordance with several of the applications contemplated for the invention, 200 rpm may be used.

To use the apparatus of Fig. 4, a source of a fluid, such as a gas cylinder 70, is connected to fluid inlet line 53. The cylinder may contain, for example, carbon dioxide which may be compressed to a super critical liquid. An appropriate solvent may be mixed in with the carbon dioxide. Using standard PARR Instruments equipment shown herein, operations may be conducted at up to 3,000 psi, although higher pressures up to 10,000 psi are contemplated. A high pressure pump 71 may be used to boost fluid pressure.

Referring to Fig. 5, in accordance with the invention, the shaft and paddle illustrated in Fig. 3 are replaced by a chuck assembly shown generally as 72. Chuck assembly 72 has a shaft 74 which is received in the internal shaft of spindle assembly 34. Shaft 74 has secured at its end a chuck member 76 which is advantageously generally in the form of a squat cylinder, but may also be a disk, as explained more fully below. A sample holder 78, in the form of a rectangular plate extends from the lower surface of chuck member 76. Sample holder 78 is formed with a plurality of through holes 80. Two of these holes 82 and 84, are threaded to receive screws 86 and 88, respectively. Screw 86 secures a clip 90, while screw 88 secures a clip 92 to sample holder 78. Clips 90 and 92 may be formed of a stiff copper alloy so that they have springy characteristics

and can serve to hold a sample 94, such as a silicon wafer, which is being processed, in place on sample holder 78.

Referring to Figs. 6A, 6B and 6C, chuck member 76 has a threaded hole 96 for receiving a threaded end of shaft 74. It also has, on its lower surface, a slot 98 for receiving sample holder 78, which after having an end thereof placed in slot 98, is secured to chuck member 76 by spot welding, in a manner well known in the art.

Chuck member 76 has a plurality of openings or through holes 100 formed therein, extending from the top surface to the bottom surface. As more fully described below, these through holes allow the working fluid to reach a sample secured to sample holder 78. While an array of four holes 100 is presently used, other array geometries are possible.

Chuck member 76 also has, along its outer, curved surface, a plurality of grooves 102. These grooves are angled with respect to the longitudinal axis of chuck member 76 and shaft 74 at an angle of 18 degrees, or 72 degrees from the planar surfaces of chuck member 76. While four grooves 102 are shown, it will be appreciated that any other number, but preferably at least two, may be used. One consideration in selecting the geometry of the array of holes 100 and grooves 102 is that chuck assembly 72 should be balanced for rotation about the axis of shaft 74.

Referring again to Fig. 5, grooves 102 perform the function of causing the working fluid in the cylinder 12 to be propelled in the vicinity of the cylinder wall. The diameter of chuck member 76 is chosen so that its

periphery is close to, but not in contact with, the cylinder wall. A typical clearance may be in the order of 3.0 mm. Also, as in Fig. 5, if the grooves extend upward and to the right, then clockwise rotation of shaft 74 (when viewed from above), will cause fluid close to the wall of cylinder 12 to be propelled upward.

Fluid introduced through opening 18, which is in close proximity to shaft 74, will be drawn downward through openings 100. It will then pass over sample 94 in a highly agitated state, thus producing the appropriate chemical reaction or cleaning in even the most critical cases. Fluid which then contains contaminates will not remain in the vicinity of sample 94. Instead the fluid will be drawn radially outward therefrom toward the wall of cylinder 12. Upon reaching the vicinity of the wall, it will be propelled upward by the grooves 102 in member 76, which act as flutes to propel the working fluid upward along the walls of cylinder 12. Thus, in addition to the fluid being highly agitated due to the rotation of chuck member 76, and to the sample 94 being placed at the very center of such agitation, fluid which carries impurities is flung radially away from the sample and carried up the walls of cylinder 12 to be exhausted from cylinder 12 through opening 103 which is placed as close to the cylinder wall as possible. There is no dead space of relatively unagitated fluid as may arise with the use of shaft and paddle assembly of the prior art, and no impurities remain to recontaminate the sample 94.

It will be understood that various modifications of the invention will occur to those skilled in the art. For example, as noted above, the chuck member may be formed as a flat relatively thin disk, and instead of grooves, a

series of impeller fingers may extend therefrom about the periphery of the disk. A sample holder may still be attached to the disk but may be configured to mount the sample to the lower surface of the disk. The fingers may extend upwardly or downwardly. Any suitable geometry may be used which thoroughly agitates the working fluid and promptly removes it from the vicinity of the sample being processed.

It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Accordingly, the present invention is intended to embrace all such alternatives, modifications and variances which fall within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A chuck assembly for holding a sample comprising:

a shaft;

a generally circular chuck member, said shaft extending from a first surface of said chuck member;

a sample holder associated with a second surface of said chuck member, said second surface being opposite said first a surface; and

a sample receiving assembly for holding the sample on the sample holder so that the sample remains fixed to the sample holder when the shaft rotates and causes said chuck member and sample holder to rotate with the shaft.

2. The apparatus of Claim 1 wherein said chuck member has, at a periphery of the chuck member, means for propelling a fluid.

3. The apparatus of Claim 1 wherein said chuck member is generally shaped as a squat cylinder, and said chuck member has a plurality of grooves, said grooves extending along an outer surface of said cylinder, said grooves being at an acute angle with respect to a longitudinal axis of said chuck member.

4. The apparatus of Claim 3 wherein said chuck member has a plurality of openings extending therethrough in a direction parallel to a longitudinal axis of said chuck member.

5. The apparatus of Claim 4 in combination with:

a reactor chamber for receiving said chuck assembly;

a spindle assembly for receiving an end of said shaft distal from said chuck member; and

a motor for rotating said spindle assembly and said shaft so that said fluid flows generally along said shaft in a first direction and through said openings in said chuck member around said sample holder and then along a wall of said chamber in a second direction generally opposite to said first direction.

6. The apparatus of Claim 5 wherein said chamber is cylindrical and said fluid flows along a wall of said chamber in said second direction.

7. The apparatus of Claim 5 further comprising:

a first opening through which a reaction fluid is introduced into said chamber; and

a second opening through which said reaction fluid is removed from said chamber.

8. The apparatus of Claim 7 wherein said first opening is disposed proximate said shaft and said second opening is disposed proximate the wall of said chamber.

9. The apparatus of Claim 5 further comprising:

temperature control means for controlling the temperature of said reactor chamber.

10. The apparatus of Claim 9 wherein said temperature control means comprises:

a mantle surrounding said reactor chamber; and

a controller for controlling the temperature of said mantle.

11. The apparatus of Claim 9 wherein said temperature control means controls the temperature of said reactor chamber so that said reactor chamber is at a temperature of between 0°C and 150°C.

12. The apparatus of Claim 1 wherein said sample receiving assembly comprises at least one clip for holding the sample to said sample holder.

13. The apparatus of Claim 12 wherein said sample holder has a plurality of through holes formed therein.

14. The apparatus of Claim 13 wherein at least one of said through holes receives a fastener for securing said clip to the sample holder.

15. The apparatus of Claim 5, further comprising:

pressurizing apparatus for pressurizing said reactor chamber.

16. The apparatus of Claim 15 wherein said pressurizing apparatus pressurizes said chamber to a pressure of up to 10,000 psi.

17. The apparatus of Claim 15 wherein said pressurizing apparatus comprises a compressed gas cylinder.

18. The apparatus of Claim 15 wherein said pressurizing apparatus includes a high pressure pump.

19. The apparatus of Claim 5 wherein said fluid is supercritical carbon dioxide.

20. The apparatus of Claim 19 wherein said fluid further comprises an organic solvent.

21. The apparatus of Claim 1 wherein said sample holder is a rectangular plate.

22. The apparatus of Claim 21 wherein said plate has a plurality of through holes formed thereon.

23. The apparatus of Claim 22, wherein said sample receiving assembly comprises at least one clip for holding the sample to said sample holder.

24. The apparatus of Claim 23, wherein at least one of said through holes receives a fastener for securing said clip to the sample holder.

25. An apparatus including a chuck assembly for holding a sample, and a reactor chamber, said apparatus comprising:

a shaft;

a generally circular chuck member, said shaft extending from a first surface of said chuck member;

a sample holder associated with a second surface of said chuck member, said second surface being opposite said first a surface;

a reactor chamber for receiving said chuck assembly;

a spindle assembly for receiving an end of said shaft distal from said chuck member; and

a motor for rotating said spindle assembly and said shaft so that fluid in said chamber flows generally along said shaft in a first direction and through said openings in said chuck member around said sample holder and then along a wall of said chamber in a second direction generally opposite to said first direction.

ABSTRACT

A chuck assembly for holding a sample includes a shaft; a generally circular chuck member, the shaft extending from a first surface of the chuck member; and a sample holder associated with a second surface of the chuck member. The second surface is opposite the first surface. A sample receiving assembly holds the sample on the sample holder so that the sample remains fixed to the sample holder when the shaft rotates and causes the chuck member and the sample holder to rotate with the shaft. The chuck assembly may be used in a reactor assembly including a reactor chamber for receiving the chuck assembly; a spindle assembly for receiving an end of the shaft distal from the chuck member; and a motor for rotating the spindle assembly and the shaft so that fluid in the chamber flows generally along the shaft in a first direction and through the openings in the chuck member, around the sample holder, and then along a wall of the chamber in a second direction generally opposite to the first direction.

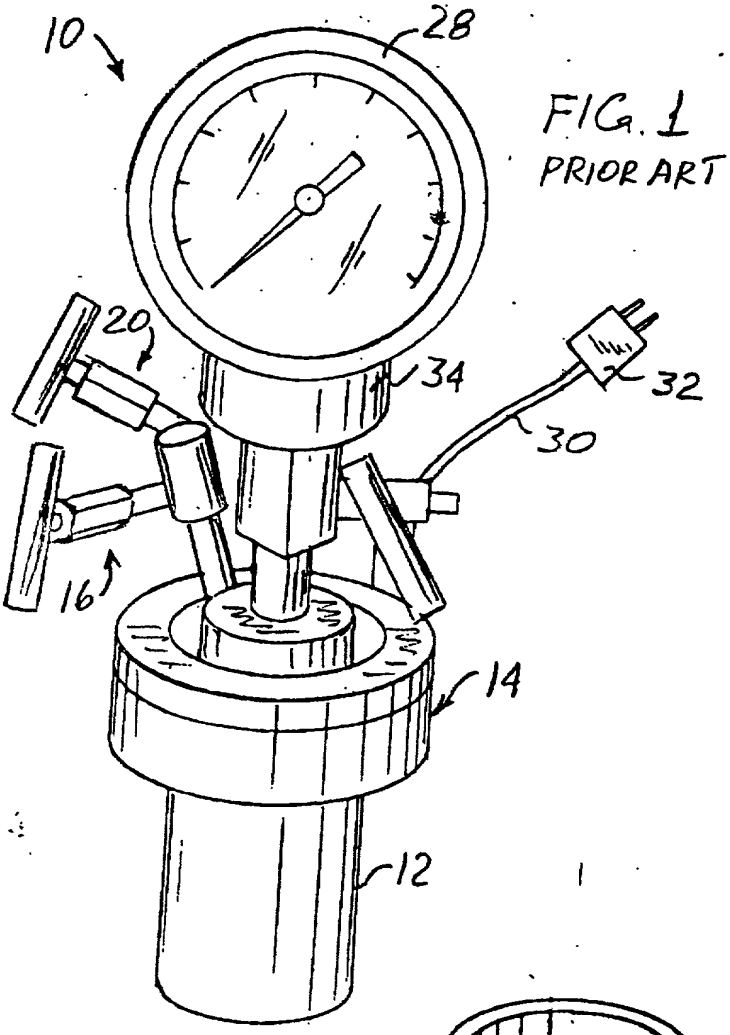


FIG. 1
PRIOR ART

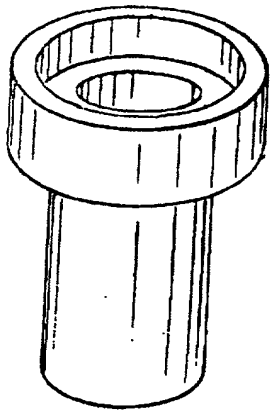


FIG. 2A
PRIOR ART

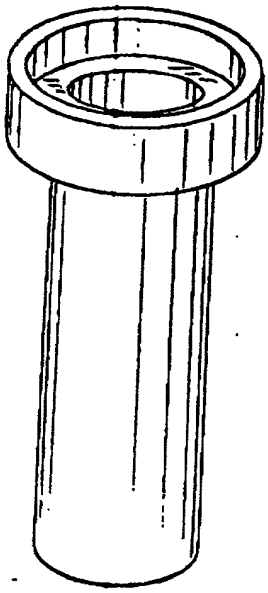


FIG. 2B
PRIOR ART

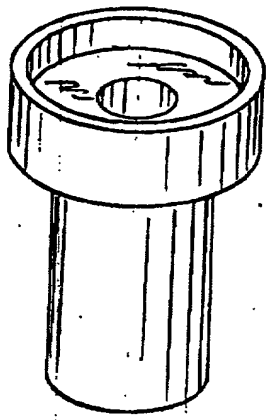


FIG. 2C
PRIOR ART

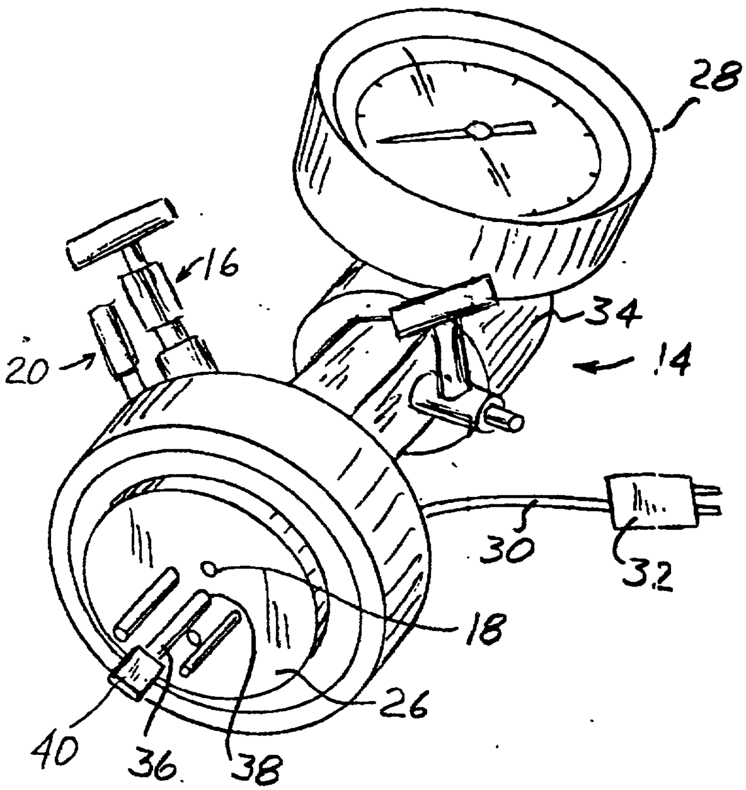
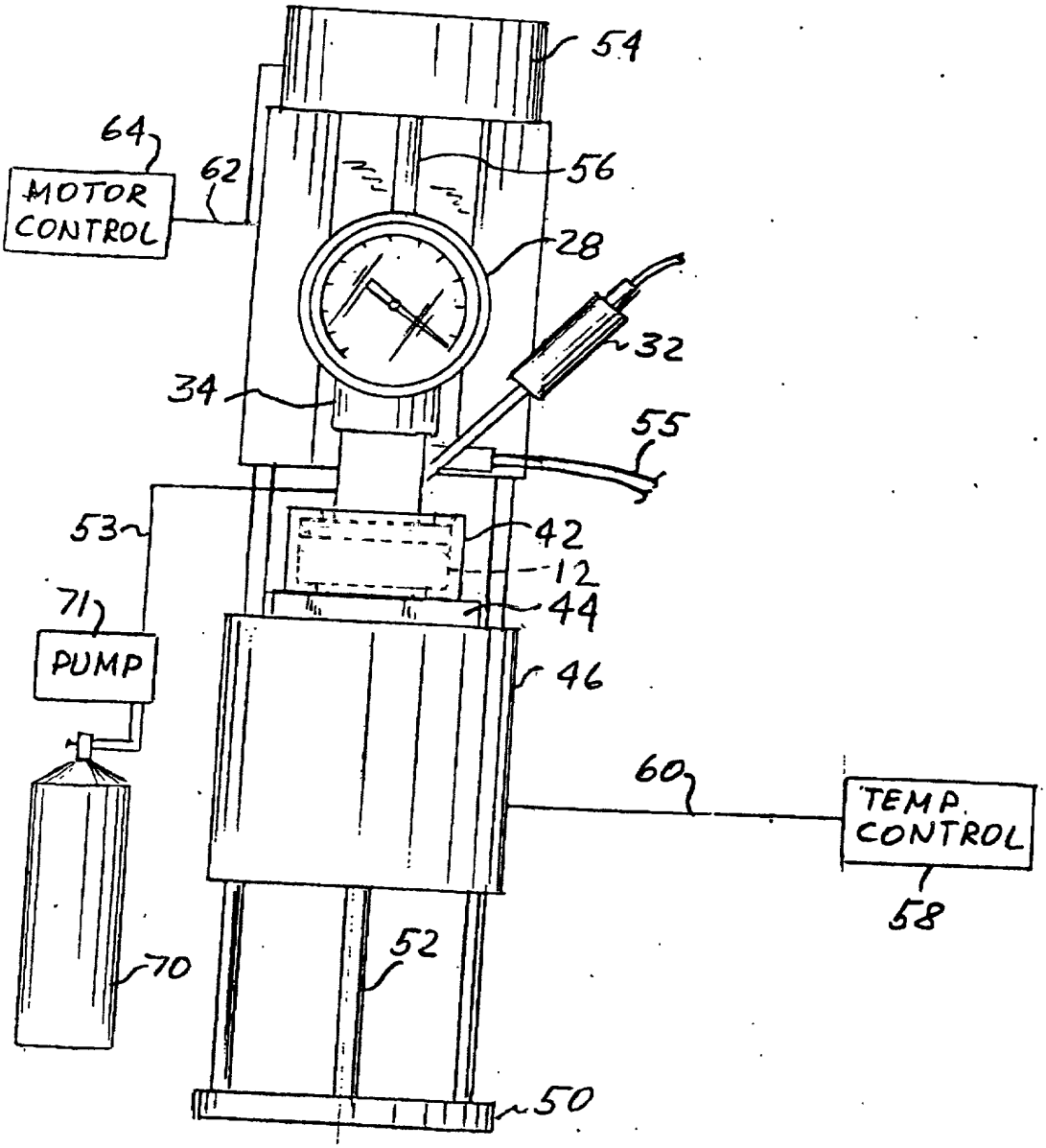


FIG. 3
PRIOR ART

FIG. 4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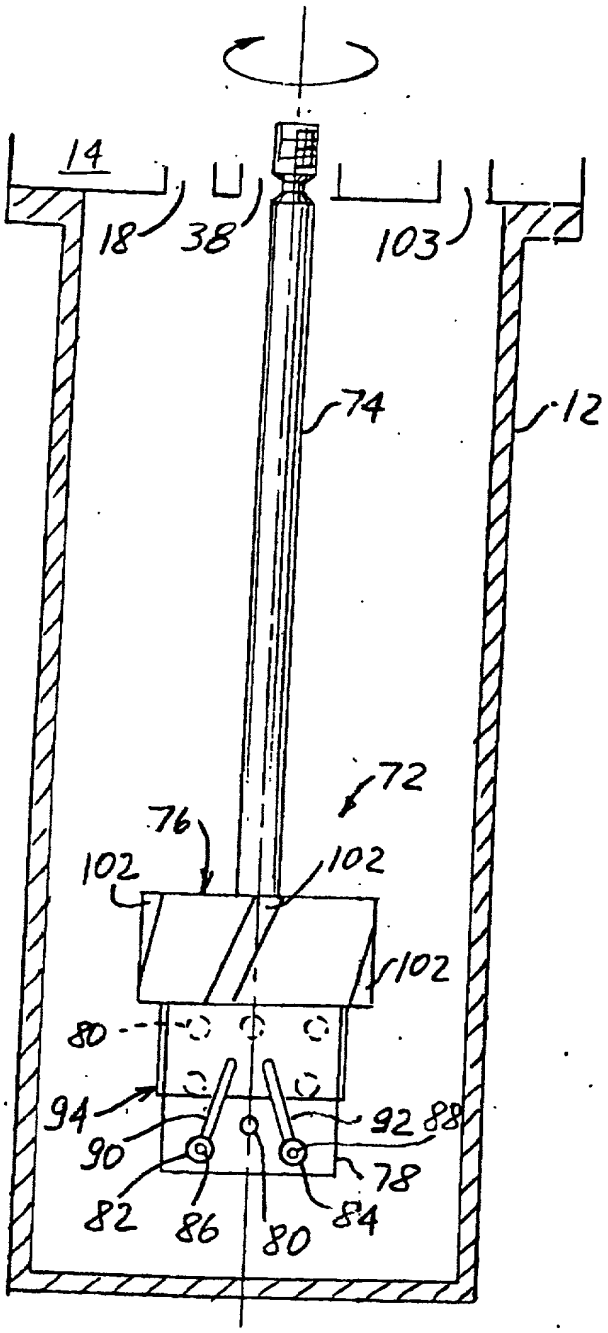

FIG. 5

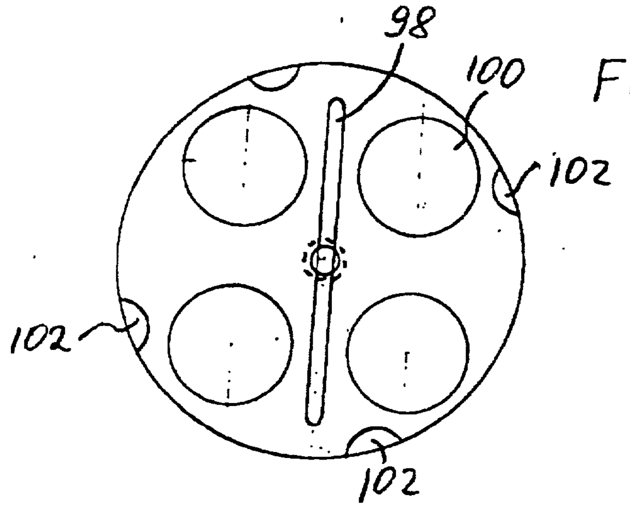

FIG. 6A

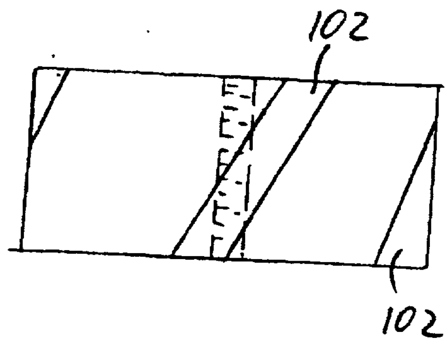

FIG. 6B

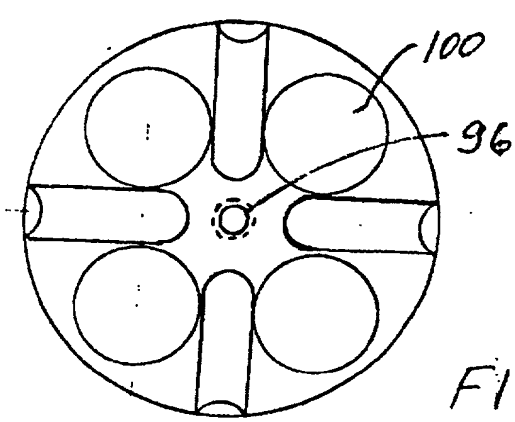

FIG. 6C

Practitioner's Docket No. 950-009252-US (PAR) **PATENT**

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION, OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

(check one applicable item below)

☒ original.

☐ design.

NOTE: With the exception of a supplemental oath or declaration submitted in a reissue, a supplemental oath or declaration is not treated as an amendment under 37 CFR 1.312 (Amendments after allowance). M.P.E.P. § 714.16, 7th Edition.

☐ supplemental.

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

☐ national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. § 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

☐ divisional.

☐ continuation.

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. § 1.53(b) (application filing requirements — nonprovisional application).

☐ continuation-in-part (C-I-P).

INVENTORSHIP IDENTIFICATION

WARNING: *If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

Sample Holding Chuck For Use In Reactor And Reactor Using Same

SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b), or (c))

(a) ☒ is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) ☐ was filed on _____, as ☐ Serial No. 0 /_____
or ☐ _____
and was amended on _____ *(if applicable).*

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 C.F.R. § 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(A) application number (consisting of the series code and the serial number, e.g., 08/123,456);

"(B) serial number and filing date;

"(C) attorney docket number which was on the specification as filed;

"(D) title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(E) title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number, e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

M.P.E.P. § 601.01(a), 7th Ed.

(c) ☐ was described and claimed in PCT International Application No. _____, filed on _____ and as amended under PCT Article 19 on _____ *(if any).*

SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))

(complete the following where a supplemental declaration is being submitted)

☐ I hereby declare that the subject matter of the

☐ attached amendment

☐ amendment filed on _____

was part of my/our invention and was invented before the filing date of the original application, above-identified, for such invention.

ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

☒ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

☐ in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. § 1.98.

PRIORITY CLAIM (35 U.S.C. §§ 119(a)–(d))

NOTE: "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119(a)–(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) ☒ no such applications have been filed.

(e) ☐ such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			☐ YES NO ☐
			☐ YES NO ☐
			☐ YES NO ☐
			☐ YES NO ☐
			☐ YES NO ☐

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)
(34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER — FILING DATE

_____ /_____ _____

_____ /_____ _____

_____ /_____ _____

CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S) UNDER 35 U.S.C. § 120

☐ The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN PART (C-I-P) APPLICATION.

NOTE: *If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.*

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

Manny W. Schecter (Reg. 31,722), Terry J. Ilardi (Reg. 29,936), Christopher A. Hughes (Reg. 26,914), Edward A. Pennington (Reg. 32,588), John E. Hoel (Reg. 26,279), Joseph C. Redmond, Jr. (Reg. 18,753), Stephen C. Kaufman (Reg. 29,551), Jay. P. Sbrollini (Reg. 36, 266), David M. Shofi (Reg. 39,835), Robert M. Trepp (Reg. 25,933), Louis P. Herzberg (Reg. 41,500), Daniel P Morris (Reg. 32,053), Paul J. Otterstedt (Reg. 37,411), Louis J. Percello (Reg. 33,206) and Douglas W. Cameron (Reg. 31,596) and Wayne L. Ellenbogen (Reg. 43,602).

(check the following item, if applicable)

☐ I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

NOTE: *"Special care should be taken in continuation or divisional applications to ensure that any change of correspondence address in a prior application is reflected in the continuation or divisional application. For example, where a copy of the oath or declaration from the prior application is submitted for a continuation or divisional application filed under 37 CFR 1.53(b) and the copy of the oath or declaration from the prior application designates an old correspondence address, the Office may not recognize, in the continuation or divisional application, the change of correspondence address made during the prosecution of the prior application. Applicant is required to identify the change of correspondence address in the continuation or divisional application to ensure that communications from the Office are mailed to the current correspondence address. 37 CFR 1.63(d)(4)." § 601.03, M.P.E.P., 7th Edition.*

SEND CORRESPONDENCE TO

☐ Address
David Aker, Esq.
Perman & Green, LLP
425 Post Road
Fairfield, CT 06430

☐ Customer Number ____________________

DIRECT TELEPHONE CALLS TO:
(Name and telephone number)

David Aker
(203) 259-1800

(complete the following if applicable)

Since this filing is a ☐ continuation ☐ divisional there is attached hereto a Change of Correspondence Address so that there will be no question as to where the PTO should direct all correspondence

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

NOTE: Each inventor must be identified by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and by his/her residence, post office address and country of citizenship. 37 CFR § 1.63(a)(3).

NOTE: Inventors may execute separate declarations/oaths provided each declaration/oath sets forth all the inventors. Section 1.63(a)(3) requires that a declaration/oath, inter alia, identify each inventor and prohibits the execution of separate declarations/oaths which each sets forth only the name of the executing inventor. 62 Fed. Reg. 53,131, 53,142, October 10, 1997,

Full name of sole or first inventor

Kenneth (GIVEN NAME) J (MIDDLE INITIAL OR NAME) McCullough (FAMILY (OR LAST NAME))

Inventor's signature Kenneth J McCullough

Date 5/25/00 **Country of Citizenship** USA

Residence 5 Birchwood Drive, Fishkill, NY 12524

Post Office Address 5 Birchwood Drive, Fishkill, NY 12524

Full name of second joint inventor, if any

Wayne (GIVEN NAME) M (MIDDLE INITIAL OR NAME) Moreau (FAMILY (OR LAST NAME))

Inventor's signature Wayne M. Moreau

Date 5/25/00 **Country of Citizenship** USA

Residence 10 Lydia Drive, Wappingers Falls, NY 12590

Post Office Address 10 Lydia Drive, Wappingers Falls, NY 12590

Full name of third joint inventor, if any

John (GIVEN NAME) P (MIDDLE INITIAL OR NAME) Simons (FAMILY (OR LAST NAME))

Inventor's signature John P. Simons

Date 5/24/2000 **Country of Citizenship** USA

Residence 51 DelBalso Blvd., Wappingers Falls, NY 12590

Post Office Address 51 DelBalso Blvd., Wappingers Falls, NY 12590

(check proper box(es) for any of the following added page(s) that form a part of this declaration)

☐ **Signature** for fourth and subsequent joint inventors. *Number of pages added* _____.

* * *

☐ **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. *Number of pages added* _____.

* * *

☐ **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. *Number of pages added* _____

* * *

☐ Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

* * *

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added _____

* * *

☐ Authorization of practitioner(s) to accept and follow instructions from representative.

* * *

(if no further pages form a part of this Declaration, then end this Declaration with this page and check the following item)

☒ This declaration ends with this page.

Practitioner's Docket No. 950-009252-US (PAR)

ADDED PAGE TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR SIGNATURE BY FOURTH AND SUBSEQUENT INVENTORS

Full name of fourth joint inventor, if any

Charles	J	Taft
GIVEN NAME	MIDDLE INITIAL OR NAME	FAMILY (OR LAST NAME)

Inventor's signature Charles J Taft

Date 5/25/2000 Country of Citizenship USA

Residence 88 Brothers Road, Wappingers Falls, NY 12590

Post Office Address 88 Brothers Road, Wappingers Falls, NY 12590

Full name of fifth joint inventor, if any

GIVEN NAME	MIDDLE INITIAL OR NAME	FAMILY (OR LAST NAME)

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____

Full name of sixth joint inventor, if any

GIVEN NAME	MIDDLE INITIAL OR NAME	FAMILY (OR LAST NAME)

Inventor's signature _____

Date _____ Country of Citizenship _____

Residence _____

Post Office Address _____